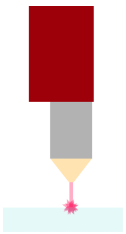
2.5D direct laser engraving of silicone micro-fluidic channels for stretchable electronics

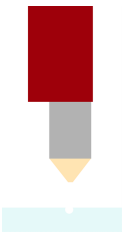
Steven Nagels [1,2], Wim Deferme [1,2]

[1] *Institute for Materials Research (IMO-IMOMEC) – Engineering Materials and Applications, Hasselt University, Wetenschapspark 1, 3590 Diepenbeek, Belgium*
[2] *Flanders Make vzw, Oude Diesterbaan 133, B-3920 Lommel, Belgium*
steven.nagels@uhasselt.be

Concept.

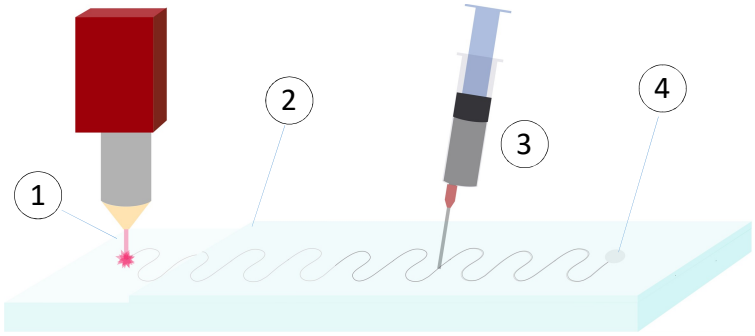


Laser ablation as a means of engraving microchannels in silicone rubbers.



Combine with **RT liquid conductor**. Stretchable conductive traces can be created within a single working day.

Stretchable electronics.



1. Laser engrave
2. Enclose channels
3. Fill with RT liquid conductor
4. **Encapsulate liquid**

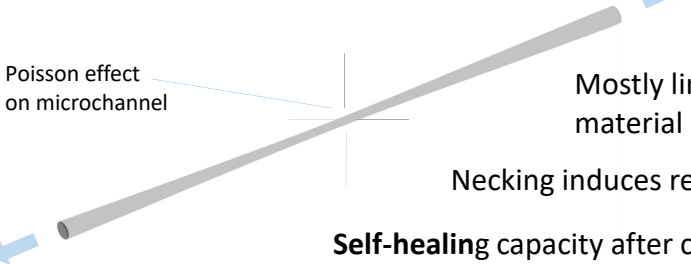
2,5D.

Vary laser power or apply multiple passes during a single engraving production step. 2,5D structures are achieved.

e.g. capacitive pressure sensor

Further possibility: **buried vias**.

Stretchability.



Mostly limited by silicone material properties.

Necking induces resistance change.

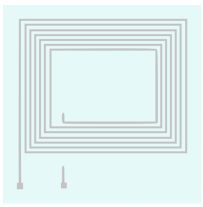
Self-healing capacity after channel pinch-off.

Use cases.

Whenever application calls for traces which are:

- single or few in number
- finely detailed
- low in resistance
- conformable
- self-healing

Component based solution not an integrated production method.



Applications.

Soft robotics

On-skin electronics

Wearables